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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
09/489,356	01/21/00	SHIH H	AM-1622.D1

IM22/1204

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EXAMINER	
ZERVIGON,R	
ART UNIT	**PAPER NUMBER**
1763	3

DATE MAILED: 12/04/00

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary

Application No.	Applicant(s)
09/489,356	Shih, et al
Examiner	**Group Art Unit**
Rudy Zervigon	1763

☒ Responsive to communication(s) filed on *Jan 21, 2000*

☐ This action is **FINAL.**

☐ Since this application is in condition for allowance except for formal matters, **prosecution as to the merits is closed** in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

A shortened statutory period for response to this action is set to expire *3* month(s), or thirty days, whichever is longer, from the mailing date of this communication. Failure to respond within the period for response will cause the application to become abandoned. (35 U.S.C. § 133). Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

Disposition of Claim

☒ Claim(s) *1-28* is/are pending in the applicat

Of the above, claim(s) *25-28* is/are withdrawn from consideration

☐ Claim(s) _____ is/are allowed.

☒ Claim(s) *1-3 and 6-24* is/are rejected.

☒ Claim(s) *4 and 5* is/are objected to.

☒ Claims *1-28* are subject to restriction or election requirement.

Application Papers

☒ See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.

☐ The drawing(s) filed on _____ is/are objected to by the Examiner.

☐ The proposed drawing correction, filed on _____ is ☐ approved ☐ disapproved.

☐ The specification is objected to by the Examiner.

☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

☐ All ☐ Some* ☒ None of the CERTIFIED copies of the priority documents have been

☐ received.

☐ received in Application No. (Series Code/Serial Number) _____.

☐ received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

*Certified copies not received: _____

☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

☒ Notice of References Cited, PTO-892

☒ Information Disclosure Statement(s), PTO-1449, Paper No(s). *2*

☐ Interview Summary, PTO-413

☒ Notice of Draftsperson's Patent Drawing Review, PTO-948

☐ Notice of Informal Patent Application, PTO-152

--- SEE OFFICE ACTION ON THE FOLLOWING PAGES ---

DETAILED ACTION

Election/Restriction

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:

I. Claims 1-22 (see below), drawn to a method for coating boron carbide, classified in class 427, subclass 450.

II. Claims 23-26, drawn to a composite structure, classified in class 428, subclass 627.

2. The inventions are distinct, each from the other because of the following reasons: Inventions I and II are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case the product as claimed can be made by another and materially different process. Specifically, processes for forming a boron carbide film may include such processes as CVD, PECVD, or sputtering.

3. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

4. During a telephone conversation with Charles S. Guenzer (650.566.8040) on November 16, 2000 a provisional election was made with traverse to prosecute the invention of a method for coating boron carbide, claims 1-22. Affirmation of this election must be made by applicant in

replying to this Office action. Claims 23-26 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

5. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a petition under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(I).

Claim Objections

6. The numbering of claims is not accordance with 37 CFR 1.126 which requires the original numbering of the claims to be preserved throughout the prosecution. When claims are canceled, the remaining claims must not be renumbered. When new claims are presented, they must be numbered consecutively beginning with the number next following the highest numbered claims previously presented (whether entered or not). Claims 6-28 have been renumbered 4-26 respectively. Applicant is required to start numbering any additional claims added during prosecution with number 27. The claim numbering of the present action are with reference to the renumbered claims 4-26.

Claim Rejections - 35 USC § 112

7. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

8. Claims 12, 13, 23, 24 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. The specification refers (Page 10, lines 7-20) to a wt% of carbon suggesting a molecular weight in the denominator. The rejected claims refer to a wt% of "carbon relative to boron" suggesting a strict ratio of atomic weights with an atomic weight in the denominator.

9. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

10. Claims 1-11 recites the limitation "a substrate" in claim 1. There is insufficient antecedent basis for this limitation in the claim.

11. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

12. Claims 1-22 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Reference is made to "...a roughness of at least 2.5μm...". Applicant does not specify what type of roughness is referred to: arithmetic roughness average or total peak-to-valley roughness height.

Claim Rejections - 35 USC § 103

13. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

14. Claims 1-22 are rejected under 35 U.S.C. 103(a) as being unpatentable J. Linke et al in view of Howard Mizuhara et al , Srihari Ponnekanti et al, Theodore J. Reinhart, Bruce H. Raeder et al, and Colin J. Smithells. Linke et al reports the protection accorded to plasma facing surfaces of plasma confining chambers by applying CVD Boron-doped graphite layers to such surfaces ("Materials and Characterization", paragraphs 3-5; "Erosion Behavior", entire section). Specifically, J. Linke et al teach:

i. A method of coating boron carbide, as B_4C grains between B_4C and $B_{13}C_3$, (CVD, "Materials and Characterization", paragraphs 3-5; "B/C ratios" - first sentence; "low-pressure plasma spray" - 6th paragraph, left column , page 228) on an aluminum-based member ("Materials and Characterization", paragraph 4; "stainless steel", "Inconel 600" each are aluminum alloys - see Colin J. Smithells for stainless steel compositions, Table 34)

ii. Forming a boron carbide layer carbide upon the surface (CVD, "Materials and Characterization", paragraphs 3-5)

iii. The boron carbide layer of 25wt% of carbon relative to boron as represented by B_4C

iv. no more than a native oxide of aluminum intervenes between the substrate and the boron carbide layer as inferred by the failure of J.Linke et al to mention any intervening layer

J. Linke et al does not specifically teach:

v. roughening a surface of a "substrate" comprising aluminum to a roughness of at least 2.5μm

Howard Mizuhara et al teach:

vi. roughening a surface of a "substrate" comprising aluminum (Table 1, p. 503) to a roughness of at most 1.17μm (Table 3, page 507) to prepare such a surface for "a reliable joint between the ceramic and metal" (left column, last paragraph, p.505)

vii. A forming step comprising surface conversion, as defined by page 16 of the specification, such that a chemical reaction or "conversion" of the ceramic surface is achieved to deposit a sealing aid used form the metal/ceramic seal. This is described by Howard Mizuhara et al according to the "active brazing process" (right column, page 504). Specifically, Howard

Mizuhara et al teaches "wetting the ceramic material is accomplished by the chemical reaction of the active element with the ceramic" (right column, page 504).

Srihari Ponnekanti et al teach failure mechanisms of aluminum parts confined in plasma environments (section III.). Specifically, Srihari Ponnekanti et al teach

viii. no more than a native oxide of aluminum (Figure 1) intervenes over the "substrate"

ix. anodizing the "substrate" to form an anodization layer (Figure 1)

x. a material of said substrate is selected from the group consisting of aluminum and aluminum alloys (Figure 1)

xi. The method further comprising removing the anodization layer (top layer, Figure 3) from a second portion (right "crack", Figure 3) of the member (lower layer, Figure 1, 3) adjacent to said first portion (left "crack", Figure 3), the roughened (per Howard Mizuhara et al see below) first portion extending below (Figure 3) a portion of the anodization left by the removing step

Theodore J. Reinhart teaches the criticality of surface preparation for joints forming composite materials (P. 682, left column, second paragraph; first sentence; last two sentences; Bullets).

Bruce H. Raeder et al teaches the processing and tooling for the surface preparations of grinding and polishing (section - "Processing & Tooling" p. 464). Specifically, Bruce H. Raeder et al teaches the types and forms of surface morphologies (Figure 4).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to enhance the surface roughness of J.Linke et al's "substrate" surface of the aluminum-based member plasma facing surface as taught by Theodore J. Reinhart and Bruce H. Raeder et al. Additionally, it would have been obvious to one of ordinary skill in the art at the time the invention was made to

xii. roughen a surface of a "substrate" comprising aluminum (Table 1, p. 503) to increase the roughness from the 1.17μm (Table 3, page 507), as taught by Mizuhara et al, to at least 2.5μm.

Motivation for enhancing the surface roughness of the J.Linke et al "substrate" surface of the aluminum-based member plasma facing surface as taught by Howard Mizuhara et al is in order to further enhance such a surface to "increase the surface energy of the surface to be bonded", additionally to "increase bond area and mechanical interlocking" as taught by Theodore J. Reinhart (P. 682, left column, second paragraph; first sentence; last two sentences; Bullets)

Additional motivation for combining the J. Linke et al and Howard Mizuhara et al teachings arise from the Srihari Ponnekanti et al discussion of the failure mechanisms of aluminum parts confined in plasma environments of semiconductor processing (Abstract, section III.)

It would have been obvious to one of ordinary skill in the art at the time the invention was made to alter the composition of the B/C ratio as suggested by J.Linke et al such that optimal protection of the plasma facing material is achieved (CVD, "Materials and Characterization", paragraphs 3-5).

Motivation for altering the composition of the B/C ratio, as suggested by J.Linke et al, such that optimal protection of the plasma facing material is achieved is supported by case law optimization:

15.MPEP 2144.05

OPTIMIZATION WITHIN PRIOR ART CONDITIONS OR THROUGH ROUTINE EXPERIMENTATION

Generally, differences in concentration or temperature will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such concentration or temperature is critical. "[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." In re Aller , 220 F.2d 454, 105 USPQ 233, 235 (CCPA 1955) (Claimed process which was performed at a temperature between 40 _ C and 80 _ C and an acid concentration between 25 and 70% was held to be prima facie obvious over a reference process which differed from the claims only in that the reference process was performed at a temperature of 100 _ C and an acid concentration of 10%.). See also In re Hoeschele , 406 F.2d 1403, 160 USPQ 809 (CCPA 1969) (Claimed elastomeric polyurethanes which fell within the broad scope of the references were held to be unpatentable

thereover because, among other reasons, there was no evidence of the criticality of the claimed ranges of molecular weight or molar proportions.). For more recent cases applying this principle, see Merck & Co. Inc . v. Biocraft Laboratories Inc. , 874 F.2d 804, 10 USPQ2d 1843 (Fed. Cir.), cert. denied , 493 U.S. 975 (1989), and In re Kulling , 897 F.2d 1147, 14 USPQ2d 1056 (Fed. Cir. 1990).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to implement Howard Mizuhara et al's active brazing process prior to the forming of the ceramic (boron carbide) layer as taught by J.Linke et al. Where the forming of the boron carbide layer comprises surface conversion of the ceramic such that a chemical reaction or "conversion" acts to deposit a sealing aid used form the metal/ceramic seal. This is described by Howard Mizuhara et al according to the "active brazing process" (right column, page 504). Specifically, Howard Mizuhara et al teaches "wetting the ceramic material is accomplished by the chemical reaction of the active element with the ceramic" (right column, page 504).

Motivation for implementing the Howard Mizuhara et al active brazing process prior to the forming of the ceramic (boron carbide) layer as taught by J.Linke et al, is discussed by Howard Mizuhara et al. Specifically, Howard Mizuhara et al describes how active brazing can provide "a reliable joint between the ceramic and metal" (left column, last paragraph, pp.505).

Conclusion

16. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Rudy Zervigon whose telephone number is (703) 305-1351. The examiner can normally be reached on a Monday through Thursday schedule from 8am through 7pm. The official after final fax phone number for the 1763 art unit is (703) 305-3599. Any Inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Chemical and Materials Engineering art unit receptionist at (703) 308-0661. If the examiner can not be reached please contact the examiner's supervisor, Gregory L. Mills, at (703) 308-1633.

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